Time Resolved XEOL Spectroscopy

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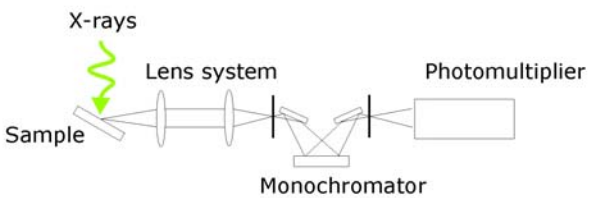
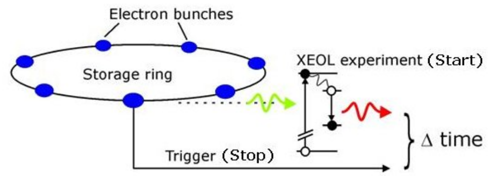
What is this all about XEOL and timing?

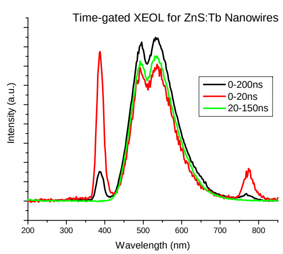


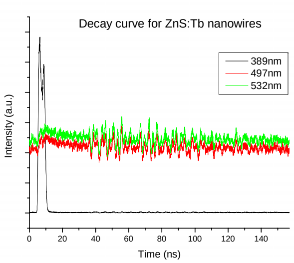
Timing. We use the pulsed synchrotron light for a 'pump-probe' like timing experiment. The duration of the pulses are in the order of 100 picoseconds, while the time gap between consecutive bunches of 153 ns gives a relatively wide time window for 'probing' optical photons. The optical decay transitions of many materials have lifetimes which are within this particular time range.

XEOL. X-ray excited optical luminescence (XEOL) monitors the decay of an electron-hole pair through optical transitions (infrared to ultraviolet range) after absorption of x-rays. Being sensitive to the size of nanostructures, for example, XEOL can be used to study the phenomenological correlation of optical with structural properties of nanostructures.



Nano Materials

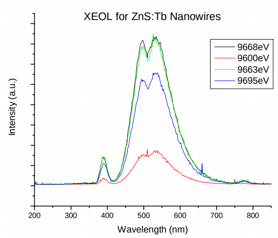




TR-XEOL.Time resolved XEOL of ZnS:Tb nanowires. Using different time windows shows the time behavior of the fast band gap (mostly within first 20 ns) transition, compared to slow transitions due to defect states.

Decay. Lifetime of the XEOL intensity at selected wave lengths (389nm, 497nm, and 532nm).

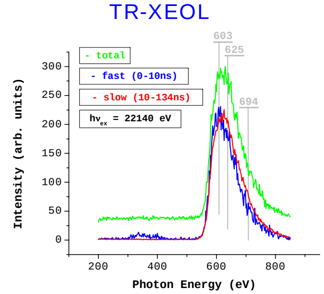
Luminescence yield. XEOL at different excitation energies at the Zn K-edge.

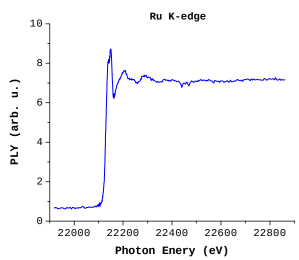


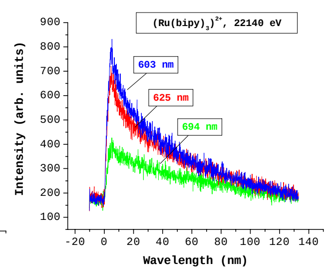
Metal-Organics

$(Ru(bipy)_3)^{2+}$ is a prototype for transition metal-based photosensitization, charge separation, and photoinduced electron-transfer chemistry. The optical transition is assigned to a metal-to-ligand charge transfer.

TR-XEOL







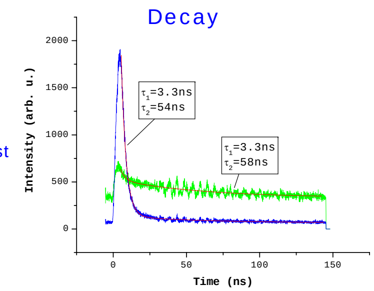
Scintillator Research

Potential scintillator materials emit in the visible light range and have relatively short lifetimes (in the nano second range).

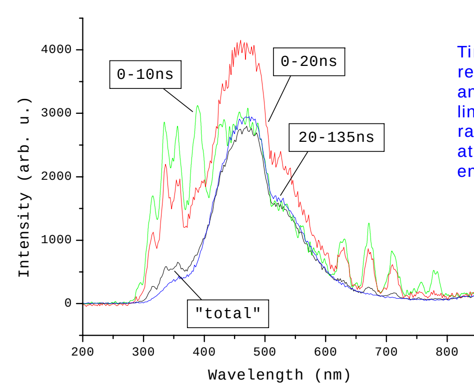
$CdWO_4$ (solgel) on glass exhibits fast and slow decay components:

- 470nm mainly slow (~56ns)
- 390nm dominates fast (~3ns)

Decay



TR-XEOL



Time resolved XEOL reveals: $CdWO_4$ fast and slow emission lines in the visible light range, after excitation at 10213eV photon energy.

Acknowledgement

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